Baffle Diffraction Circuit Design for ML TL Enclosure with Lowther DX3 Driver #1 **4/20/03**

Unit and Constant Definition

$cycle := 2 \cdot \pi \cdot rad$

$Hz := \frac{cycle}{sec}$

Air Density : $\rho := 1.164 \cdot \frac{kg}{m^3}$

Speed of Sound : $c := 345 \cdot \frac{m}{sec}$

Set-up Counters

Frequency Domain

$N := \frac{19995}{5}$

$s := 2, 3 .. N$

$d\omega := 5 \cdot Hz$

Import Driver Measured Data - On Axis

$Data := 0 \quad f := 0 \quad Temp := 0$

$Data := READPRN("DX3\_SYS1.FRD")$

$k_{max} := rows(Data) \qquad k := 0, 1 .. k_{max} - 1$

$f_k := Data_{k,0}$

$Temp_k := Data_{k,1}$

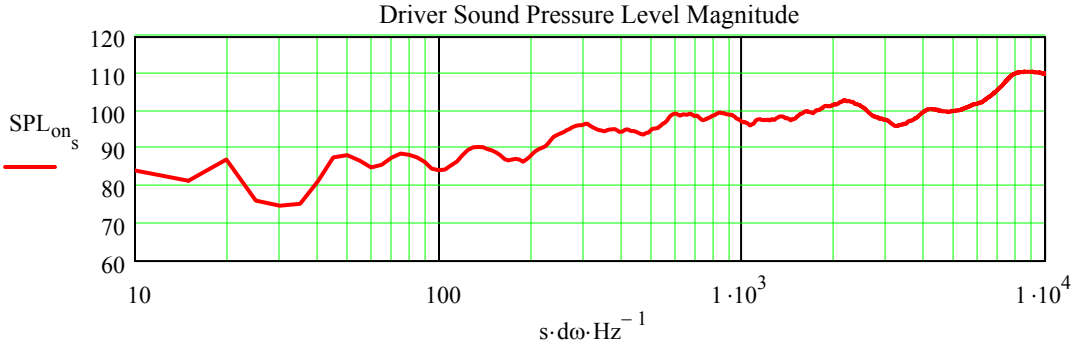
$smooth := cspline(f, Temp) \qquad Mag(s) := interp\left(smooth, f, Temp, \frac{s \cdot d\omega}{Hz}\right) \qquad M_s := 2 \cdot 10^{-5} \cdot 10^{\frac{Mag(s)}{20}}$

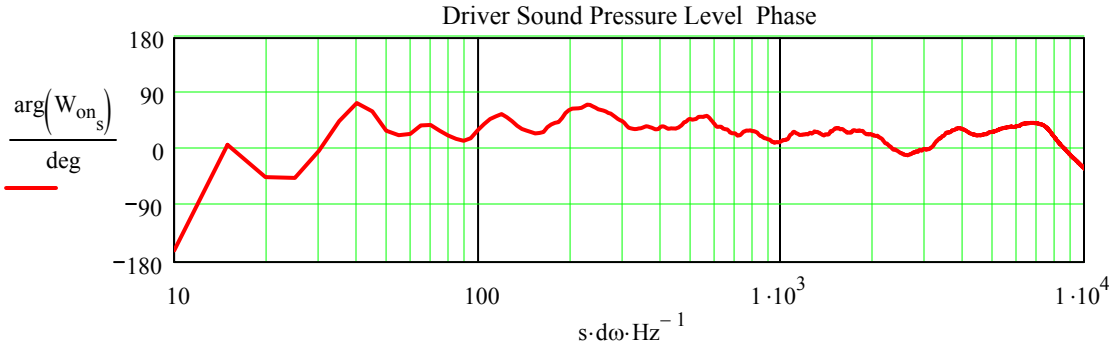
$Temp_k := Data_{k,2}$

$smooth := cspline(f, Temp) \qquad Phase(s) := interp\left(smooth, f, Temp, \frac{s \cdot d\omega}{Hz}\right) \qquad P_s := Phase(s)$

$W_{on_s} := \left(M_s \cdot Pa\right) \cdot \exp\left(j \cdot P_s \cdot deg\right)$

$SPL_{on_s} := 20 \cdot \log\left(\frac{\left|W_{on_s}\right|}{2 \cdot 10^{-5} \cdot Pa}\right)$





Import Driver Measured Data - Off Axis

$Data := 0 \quad f := 0 \quad Temp := 0$

$Data := READPRN("DX3\_OFF1.FRD")$

$k_{max} := rows(Data) \qquad k := 0, 1 .. k_{max} - 1$

$f_k := Data_{k,0}$

$Temp_k := Data_{k,1}$

$smooth := cspline(f, Temp) \qquad Mag(s) := interp\left(smooth, f, Temp, \frac{s \cdot d\omega}{Hz}\right) \qquad M_s := 2 \cdot 10^{-5} \cdot 10^{\frac{Mag(s)}{20}}$

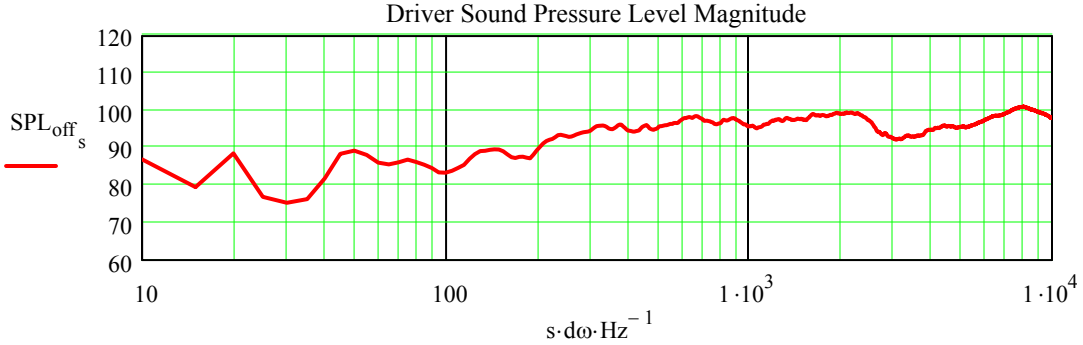
$Temp_k := Data_{k,2}$

$smooth := cspline(f, Temp) \qquad Phase(s) := interp\left(smooth, f, Temp, \frac{s \cdot d\omega}{Hz}\right) \qquad P_s := Phase(s)$

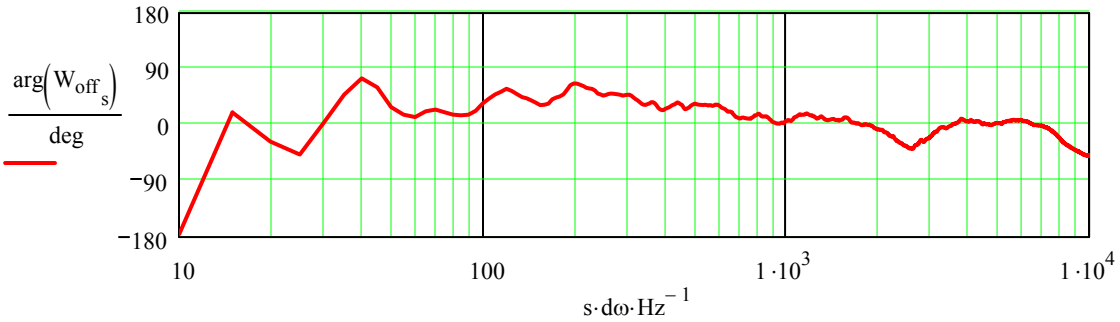
$W_{off_s} := \left(M_s \cdot Pa\right) \cdot \exp\left(j \cdot P_s \cdot deg\right)$

$SPL_{off_s} := 20 \cdot \log\left(\frac{\left|W_{off_s}\right|}{2 \cdot 10^{-5} \cdot Pa}\right)$

Driver Sound Pressure Level Magnitude



Driver Sound Pressure Level Phase



Import Woofer Impedance Data

$Data := 0 \quad f := 0 \quad Temp := 0$

$Data := READPRN("DX3\_IMP1.ZMA")$

$k_{max} := rows(Data) \qquad k := 0, 1 .. k_{max} - 1$

$f_k := Data_{k,0}$

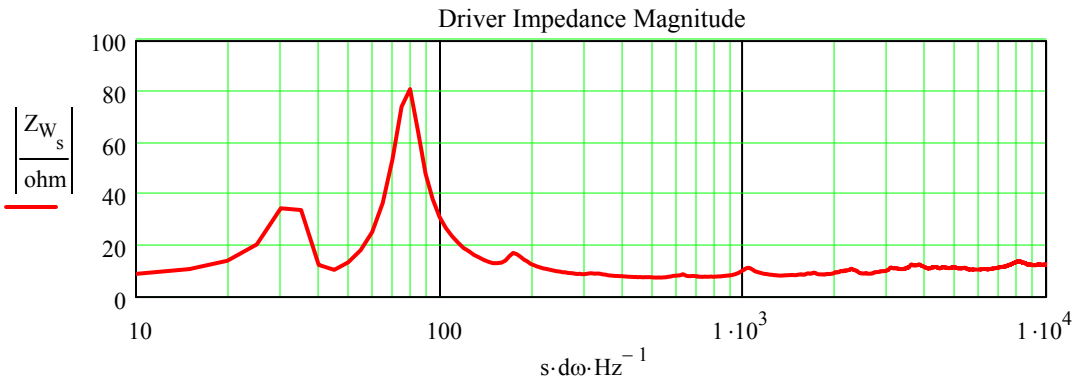
$Temp_k := Data_{k,1}$

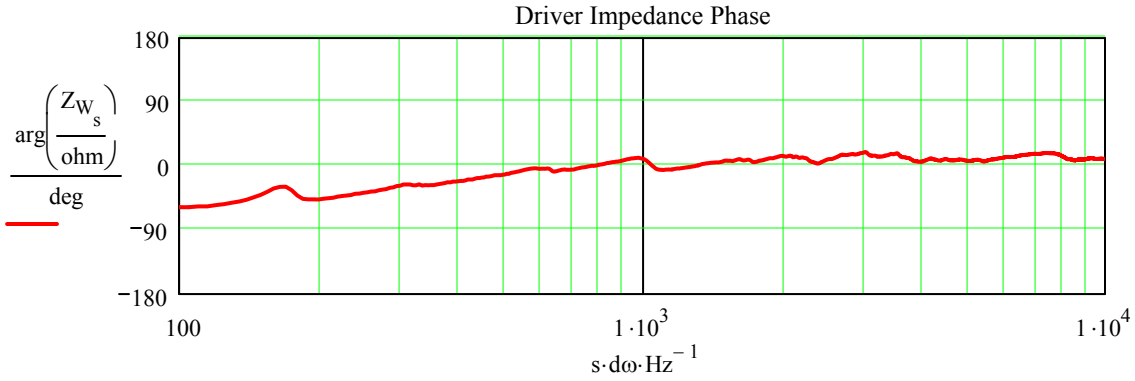
$smooth := cspline(f, Temp) \qquad Mag(s) := interp\left(smooth, f, Temp, \frac{s \cdot d\omega}{Hz}\right) \qquad M_s := Mag(s)$

$Temp_k := Data_{k,2}$

$smooth := cspline(f, Temp) \qquad Phase(s) := interp\left(smooth, f, Temp, \frac{s \cdot d\omega}{Hz}\right) \qquad P_s := Phase(s)$

$Z_{W_s} := \left[\left(M_s \cdot ohm\right) \cdot \exp\left(j \cdot P_s \cdot deg\right)\right]$





Compensation Circuit

$R_e := 7.1 \cdot ohm$

$1.25 \cdot R_e = 8.875\ ohm$

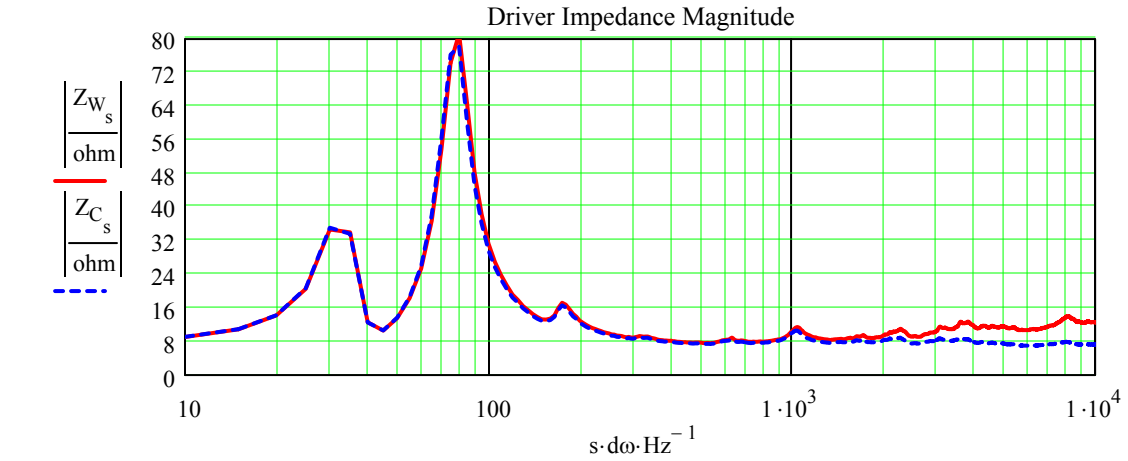
$L_{vc} := 0.4 \cdot mH$

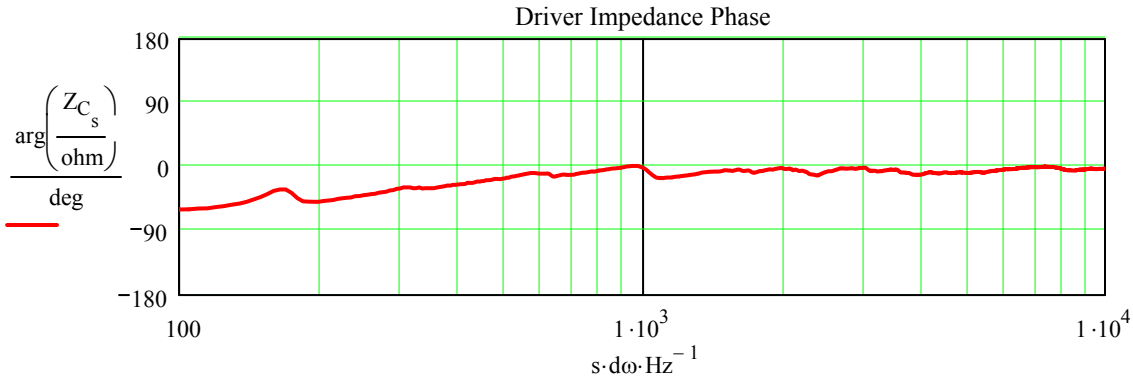
$L_{vc} \cdot (1.25 \cdot R_e)^{-2} = 5.078\ \mu F$

$R_c := 15 \cdot ohm$ (Mills 15 ohm / 12 watt resistor, Parts Express # 005-15)

$C_c := 3.2 \cdot \mu F$ (Solen 3 uF, Parts Express # 027-542)

$$Z_{C_s} := \left[\left(Z_{W_s} \right)^{-1} + \left(R_c + \frac{1}{j \cdot s \cdot d\omega \cdot C_c} \right)^{-1} \right]^{-1}$$





Baffle Step Correction Circuit Design

$R_1 := 8 \cdot ohm$ (Mills 8 ohm / 12 watt resistor, Parts Express # 005-8)

$R_2 := 15 \cdot ohm$ (Mills 15 ohm / 12 watt resistor, Parts Express # 005-15)

$L_1 := 4.0 \cdot mH$ (ERSE Super Q 4.0 mH, Parts Express # 266-922)

$L_2 := 4.0 \cdot mH$ (ERSE Super Q 4.0 mH, Parts Express # 266-922)

$$Z1_s := \left[R_1^{-1} + \left(0.385 \cdot ohm + j \cdot s \cdot d\omega \cdot L_1\right)^{-1} \right]^{-1}$$

$$Z2_s := \left[R_2^{-1} + \left(0.385 \cdot ohm + j \cdot s \cdot d\omega \cdot L_2\right)^{-1} \right]^{-1}$$

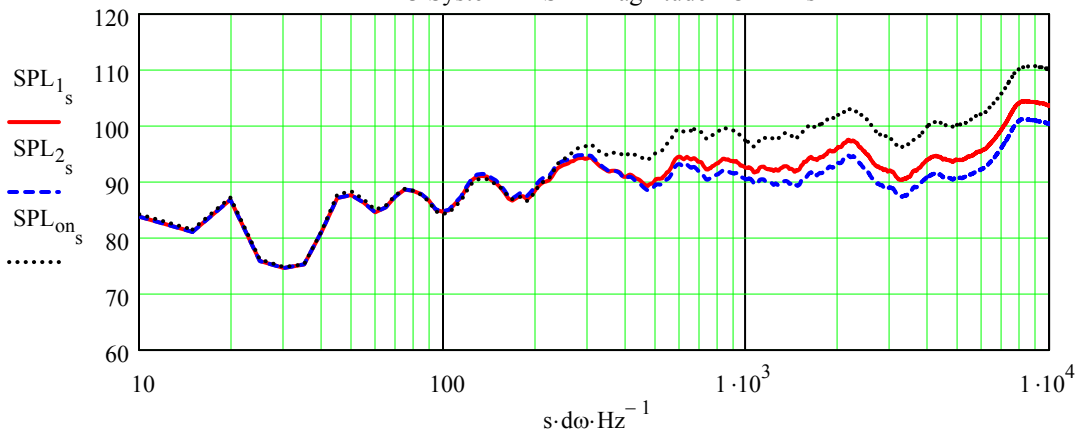
$$V1_s := ZC_s \cdot \left(Z1_s + ZC_s\right)^{-1}$$

$$V2_s := ZC_s \cdot \left(Z2_s + ZC_s\right)^{-1}$$

$$SPL1_s := 20 \cdot \log\left(\frac{\left| V1_s \cdot Won_s \right|}{2 \cdot 10^{-5} \cdot Pa} \right)$$

$$SPL2_s := 20 \cdot \log\left(\frac{\left| V2_s \cdot Won_s \right|}{2 \cdot 10^{-5} \cdot Pa} \right)$$

DX3 System #1 SPL Magnitude - On Axis



$$SPL1_s := 20 \cdot \log\left(\frac{\left| V1_s \cdot Woff_s \right|}{2 \cdot 10^{-5} \cdot Pa} \right)$$

$$SPL2_s := 20 \cdot \log\left(\frac{\left| V2_s \cdot Woff_s \right|}{2 \cdot 10^{-5} \cdot Pa} \right)$$

DX3 System #1 SPL Magnitude - Off Axis